

REMARKS

Claims 1, 4, 5, 11, 12, 13 and 41 have been amended. Claims 2, 3, 9, 10, 14, 15, 28, 29 and 42 have been cancelled. Claims 6-8, 18-20 and 31-40 have been withdrawn. Claims 1, 4-5, 11-13, 16, 17, 21-27, 30, and 41 remain pending in the application. The amendments to claims 1 and 13 are fully supported in the specification as originally filed. The claim amendments are supported for example in paragraphs [0008], [0009], [0036], [0079]-[0086] and [0090]-[0096].

Applicants wish to thank the Examiner for the telephonic interview on March 23, 2004 where the cited references were discussed. In particular, Applicants disagree with the position of the Examiner regarding the inherency issues discussed in the office action on page 7. Applicants respectfully request reconsideration of the pending claims.

A. Election/Restriction

The Office Action determined that newly submitted Claim 40 was directed to a non-elected invention. Claim 40 has been withdrawn.

B. Rejections Under 35 U.S.C. § 102(b)

Claims 1-5, 9-11, 41, 42 and 13-17, 21, 25-30 were rejected under 35 U.S.C. § 102(b) as being anticipated by US 5,429,708 (Linford et al.) and claims 13 and 21-24 under 35 U.S.C. § 102(b) as being anticipated by Tsukune, et. al. (JP 6-84853 A). Applicant respectfully traverses this rejection and note that the rejection is moot with respect the canceled claims.

Axiomatically, rejection of a claim for anticipation by a reference requires that the reference explicitly or inherently describe all of the elements, limitations, and relationships recited in the claim.

Claims 1 and 13 have been amended to include the limitations of claims 2, 3, 9, 10 (for claim 1) and claims 14, 15, 28 and 29 (for claim 13). Neither Linford or Tsukune teach a semiconductor substrate comprising: a monocrystalline silicon-containing material having a surface substantially free of oxidation; and an organic layer having more than half of its atoms

being carbon and hydrogen, wherein the organic layer is chemically bonded to the surface of the silicon-containing material, wherein an electrical property selected from surface recombination velocity, carrier lifetime, electronic efficiency, voltage, device capacitance, contact resistance, and resistance of a doped region of the semiconductor substrate is changed as compared to the electrical property of the substrate in the absence of the organic layer, or a process of making such a substrate.

Neither Linford or Tsukune describe or disclose a semiconductor substrate including the claimed elements of claims 1 or 13 and therefore, claims 1 and 13, along with their dependent claims, are not anticipated by Linford or Tsukune. For example, Linford and Tsukune are silent with respect to a semiconductor substrate having an organic layer requiring more than half of its atoms being carbon and hydrogen. Neither Linford or Tsukune describe a semiconductor substrate as claimed by Applicants and having "an electrical property selected from surface recombination velocity, carrier lifetime, electronic efficiency, voltage, device capacitance, contact resistance, and resistance of a doped region of the semiconductor substrate is changed as compared to the electrical property of the substrate in the absence of the organic layer".

The Office Action suggests that Tsukune discloses a silicon containing substrate having improved voltage however Applicants submit that Tsukune does not disclose a semiconductor substrate having each and every element of Applicants' claimed substrate in claim 1 or claim 13. Further, neither reference enables one of skill in the art to select any particular organic compound based on a desire to change or improve electrical properties as compared with a device not having an organic layer. Accordingly, Applicants respectfully request withdrawal of this rejection under §102.

C. Rejection Under 35 U.S.C. § 103(a)

Claim 12 was rejected under 35 U.S.C. 103(a) as being unpatentable over Linford in view of US 3,961,353 (Aboaf, et. al.). Applicants respectfully traverse this rejection with regards to amended claims 1 and 13 and claim 12.

The Office Action states that Linford “discloses each of the claimed features except for indicating the porosity to have an upper limit of 30%” and that “Aboaf teaches a semiconductor device having a porous layer of silicon 12, wherein the silicon has a porosity of 15%”. The Office Action concludes that it would have been obvious for one of ordinary skill in the art to limit the porosity at no greater than 15% and that to limit the porosity at no greater than 30% is an obvious matter of design choice.

To establish a *prima facie* case of obviousness, the three basic criteria must be met: (1) there must be some suggestion or motivation to modify the reference as proposed by the Examiner; (2) there must be a reasonable expectation of success and (3) the prior art reference must teach or suggest all of the claim limitations. Applicants submit that all of the criteria has not been met in this case.

Linford describes a method of altering a hydrogenated (30) or clean (38) silicon surface to create a silicon surface (40) having moieties (44) directly bonded to surface silicon atoms (32) to form molecular layer 45. (US 5,429,708, col. 4, lines 22-29). The Office Action correctly points out that there is nothing in Linford to suggest a surface with a porosity no greater than approximately 30 percent, as required by the present invention.

Aboaf discloses method for fabricating a wafer or substrate (11) on which a porous layer (12) is provided on the backside of the substrate that is 100 microns thick and of 15% porosity as measured by weight loss in the porous layer.” (US 3,961,353, col. 2, lines 18-43). Aboaf further states that a polycrystalline silicon layer (15) is deposited over the porous region to protect against oxidation in subsequent processing steps. (US 3,961,353, col. 3, lines 3-6).

There is no suggestion or motivation to modify the Linford device by the teachings in Aboaf as proposed in the Office Action. Neither Linford nor Aboaf, alone or in combination, describe an electrical structure comprising a silicon-containing material having a surface with a porosity no greater than approximately 30 percent, and an organic layer chemically bonded to the surface of the silicon-containing material, wherein an electrical property of the electrical structure is significantly improved compared to a same structure without the organic layer. Aboaf teaches depositing a silicon surface (15) on top of a porous layer (12) on the backside of a semiconductor substrate. Nowhere in Aboaf is it shown that the backside silicon layer is

used for either 1) an electrical connection or 2) as a base to grow an organic layer. If the Linford device was modified by the teachings in Aboaf, as suggested by the Office Action, the porous layer would be on a backside of the device in Linford, opposite the molecular layer 45, and a silicon layer would be deposited on the porous layer, not an organic layer. Therefore, there is no suggestion or motivation to modify the backside of the Linford device with the teachings in Aboaf.

The modification of Linford does not have a reasonable expectation of success. As discussed above, the teachings in Aboaf concerning the porous surface, and any deposits thereon, are directed to the backside of a structure away from the electrical structures. In addition, the backside porous surface is covered with a silicon layer, not a organic layer. Thus, neither Linford nor Aboaf, alone or in combination, can provide the device claimed in the present invention.

Further, amended claims 1 and 13 recite a semiconductor substrate and method of making such a structure, respectively, including limitations that are neither disclosed nor suggested by Linford nor Aboaf, either when taken alone or in combination. Neither reference discloses a substrate having improved or changed electrical properties with an organic layer or coating, and neither reference describes a method for identifying such organic coatings. Further, as discussed in the Declaration under 1.132 filed with the previous response on September 4, 2003, merely attaching an organic layer to a silicon surface does not inherently result in an electrical structure wherein an electrical property is improved compared to a same structure without the organic layer. Specifically, the graph presented with that Declaration shows that a silicon surface modified by a method according to Linford, specifically through the use of benzoyl peroxide as a radical initiator and 1-octene as the organic reactant, does not result in an electrical structure having improved properties. The graph shows that such a modified surface undergoes rapid lifetime decay upon exposure to air. Linford also specifies that some of the surfaces described therein are alkylated whereas some surfaces (specifically surfaces produced using peroxide-type radical initiators) primarily, or additionally, contain Si-O-C(O)-R linkages. Thus, it is clear that merely attaching an organic layer to a silicon surface

(as described in the cited references) does not inherently result in an electrical structure wherein an electrical property of the electrical structure is significantly improved compared to a same structure without the organic layer. Further, neither Linford nor Aboaf, either alone or in combination provide a method of making a substrate including analyzing the substrate for an improved electrical property and further having more than half of the atoms in the organic layer being carbon and hydrogen.

Accordingly, reconsideration and withdrawal of the rejection of claims 1, 12, and 13 under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, reconsideration and favorable action on all claims are respectfully requested. In the event any matters remain to be resolved, the Examiner is requested to contact the undersigned at the telephone number given below so that a prompt disposition of this application can be achieved.

Enclosed is a check in the amount of \$475.00 for the Three (3) Month Extension of Time fee. The Commissioner is hereby authorized to charge any other fees associated with the filing submitted herewith, or credit any overpayments to Deposit Account No. 50-1355.

Respectfully submitted,

Date: March 29, 2004



Lisa A. Haile, J.D., Ph.D.

Reg. No. 38,347

Telephone No.: (858) 677-1456

Facsimile No.: (858) 677-1465

GRAY CARY WARE & FREIDENRICH LLP
4365 Executive Drive, Suite 1100
San Diego, California 92121-2133
USPTO CUSTOMER NUMBER 28213